

Application No. 09/555,523
Reply to Office Action dated July 22, 2003

REMARKS

Claims 1, 20, 39-41 and 43-45 have been amended such that the claimed oily phase consists essentially of liquid oils. Support for these amendments exists, *inter alia*, at page 6, line 19 *et seq.* and page 11. Claims 1-10, 12, 13, 15-32 and 34-46 are currently pending, although claims 12, 13 and 30-32 have been withdrawn from consideration. Upon indication of allowable subject matter, Applicants intend to seek rejoinder of the withdrawn claims.

The Office Action rejected claims 1-10, 15-29 and 34-46 under 35 U.S.C. §103 as obvious over JP 09255529 (“JP ‘529”) in combination with U.S. patent 5,326,484 (“Nakashima”). In view of the following comments, Applicants respectfully request reconsideration and withdrawal of this rejection.

The claimed invention requires the oily phase to consist essentially of liquid oils. The primary reference, JP ‘529, neither teaches nor suggests this limitation. To the contrary, JP ‘529 teaches away from O/W emulsions in which the oily phase consists essentially of liquid oils.

Specifically, JP ‘529 states that 0.5-20% of a solid oily component must be present in its compositions. (See, “[Solution]” on p. 3/34 and par. [0021] on p. 16/34). In fact, JP ‘529 teaches that if less than 0.5% solid oily component is present, the resulting product is unacceptable. (See, par. [0021] on p. 16/34). Moreover, JP ‘529’s comparative example 2 demonstrates that compositions containing an oily phase lacking solid fatty substances are unacceptable and, thus, that substantial amounts of solid fatty substances must be present. (See, par. [0052] on p. 27/34). Therefore, JP ‘529 teaches that the presence of substantial

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amounts of solid fatty substances materially affects the compositions disclosed therein and requires that its compositions contain such substantial amounts of fatty substances.

In contrast, the claimed oily phase “consists essentially of” liquid oils. That is, the claimed oily phase cannot contain sufficient solid fatty substance to materially affect it. See, *PPG Industries v. Guardian Indus. Corp.*, 156 F.3d 1351, 1354 (Fed. Cir. 1998) (copy attached) (“consisting essentially of” language opens claims to unlisted ingredients that do not materially affect the basic and novel properties of the invention). Because JP ‘529 teaches that sufficient solid fatty substance must be present to materially affect the properties of the compositions disclosed therein, JP ‘529 actually teaches away from the claimed oily phase. One skilled in the art, following JP ‘529, would not be motivated to produce an O/W emulsion in which the fatty substances in the oily phase consist essentially of liquid oils. Rather, she would be motivated to produce an oily phase containing an amount of solid fatty substances that adversely affects the composition’s characteristics.

Nakashima fails to compensate for JP ‘529’s deficiencies: nothing in Nakashima would motivate one skilled in the art to modify JP ‘529, contrary to the teachings of JP ‘529, such that the fatty substances in the oily phase consist essentially of oils.

For this reason alone, the rejection under 35 U.S.C. §103 is improper and should be withdrawn.

Moreover, no motivation would exist to combine JP ‘529 and Nakashima with the expectation that a stable emulsion containing monodispersed globules would be obtained. JP ‘529 does not teach or suggest monodispersed globules. Also, as noted above, JP ‘529 teaches that a substantial amount of solid fatty substance must be present. There is no indication that

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JP '529's oil phases containing substantial amounts of solid fatty substances could be subjected to Nakashima's methods or that, if subjected to such methods, JP '529's O/W emulsions would emerge stable and monodispersed. This is particularly true in view of the fact that Nakashima is virtually silent regarding what oils can be used in his methods. The only teaching Nakashima provides in this regard is in his examples directed to O/W emulsions where the oil phase is a non-solid oil, kerosene. (See, examples I and II directed to O/W emulsions at col. 9, line 50 and col. 11, line 11, respectively).

Given such a minimal disclosure regarding acceptable oils for use in his methods, Nakashima cannot be said to teach or suggest that his methods would have been obvious to use for any oil phase with the expectation that acceptable, stable, monodispersed compositions would be obtained, particularly oil phases containing a substantial amount of solid fatty substances.

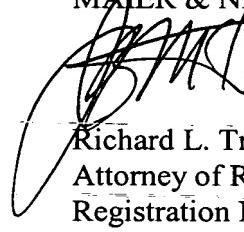
In view of the above, Applicants respectfully submit that the §103 rejection based upon JP '529 and Nakashima is improper and should be withdrawn.

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Applicants respectfully submit that the present application is in condition for allowance. Prompt and favorable consideration is earnestly solicited.

Respectfully submitted,

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Cite as 156 F.3d 1351 (Fed. Cir. 1998)

minor and incidental to assembly was not clearly erroneous, we

AFFIRM.



PPG INDUSTRIES, Plaintiff-Appellant,

GUARDIAN INDUSTRIES CORP.,
Defendant-Appellee.

No. 97-1513.

United States Court of Appeals,
Federal Circuit.

Oct. 1, 1998.

Rehearing Denied; Suggestion for
Rehearing In Banc Declined

Nov. 25, 1998.

Patentee brought infringement action against competitor, alleging infringement of its patent for automotive solar control glass, and preliminary injunction granted to patentee was affirmed, 75 F.3d 1558. Following jury trial, the United States District Court for the Western District of Pennsylvania, Gary L. Lancaster, J., entered judgment upon verdict for competitor and denied patentee's motions for judgment as a matter of law and for a new trial. Patentee appealed. The Court of Appeals, Bryson, Circuit Judge, held that: (1) whether iron sulfide present in accused glass had material effect on glass, so as to distinguish it from patented glass, was question for jury, not matter of claim construction; (2) statement in specification did not pertain to whether presence of iron sulfide would materially affect glass; and (3) finding of noninfringement was supported by substantial evidence.

Affirmed.

Michel, Circuit Judge, filed dissenting opinion.

1. Patents \Leftrightarrow 101(2)

By using the term "consisting essentially of," the patent drafter signals that the invention necessarily includes the listed ingredients and is open to unlisted ingredients that do not materially affect the basic and novel properties of the invention; a "consisting essentially of" claim occupies a middle ground between closed claims that are written in a "consisting of" format and fully open claims that are drafted in a "comprising" format.

2. Patents \Leftrightarrow 314(5)

Whether iron sulfide present in accused solar control glass had material effect on glass, so as to distinguish accused glass from glass claimed in patent which defined glass as having composition "consisting essentially of" listed ingredients, was not matter of claim construction but was instead issue for jury as part of infringement determination.

3. Patents \Leftrightarrow 101(5)

Patent claims may be drafted using terminology that is not as precise or specific as it might be, so long as the result complies with the statutory requirement to particularly point out and distinctly claim the subject matter which the applicant regards as his invention. 35 U.S.C.A. § 112.

4. Patents \Leftrightarrow 165(3)

Court, under the rubric of claim construction, may not give a patent claim whatever additional precision or specificity is necessary to facilitate a comparison between the claim and the accused product; rather, after the court has defined the claim with whatever specificity and precision is warranted by the language of the claim and the evidence bearing on the proper construction, the task of determining whether the construed claim reads on the accused product is for the finder of fact.

5. Patents \Leftrightarrow 101(2)

Statement in patent specification indicating that residual amounts of SO₃ would have no effect on properties of claimed solar control glass referred only to sulfate, not iron sulfide, so court's definition of "consisting essentially of," as used in patent claim describing glass as composition "consisting essentially of" listed ingredients, did not have

to incorporate such information from specification for purpose of jury's determination of whether iron sulfide present in accused glass had material effect on glass, so as to distinguish accused glass from glass claimed in patent.

6. Patents \ominus 312(6)

Jury's finding that iron sulfide residues in accused solar control glass, which resulted from float glass process, materially affected basic and novel characteristics of glass claimed in patent, such that accused glass did not infringe patent, was supported by substantial evidence, notwithstanding evidence that effects of iron sulfide were small or that effect of iron sulfide in accused glass and preferred embodiment of patent were identical in most respects.

Ford F. Farabow, Finnegan, Henderson, Farabow, Garrett & Dunner, L.L.P., Washington, DC, argued, for plaintiff-appellant. With him on the brief were Donald R. Dunner, and Darrel C. Karl. Of counsel on the brief were Arland T. Stein and Robert A. Matthews, Jr., of Reed Smith Shaw & McClay, Pittsburgh, PA.

Robert G. Krupka, P.C., Kirkland & Ellis, Chicago, IL, argued, for defendant-appellee. With him on the brief were Jeffrey D. Mills, Jay I. Alexander and Gregg F. LoCascio, Washington, DC, and John M. Desmarais, New York City.

Before MICHEL, PLAGER, and BRYSON, Circuit Judges.

Opinion for the court filed by Circuit Judge BRYSON. Dissenting opinion filed by Circuit Judge MICHEL.

BRYSON, Circuit Judge.

This case involves a type of glass composition known as "solar control glass," which is used to produce tinted automobile windows. PPG Industries, Inc., sued Guardian Industries Corp. in the United States District Court for the Western District of Pennsylvania, asserting that Guardian was infringing PPG's U.S. Patent No. 5,240,886 (the '886 patent) by marketing a type of solar control

glass known as Solar Management Glass (SMG). After a ten-day trial, a jury concluded that SMG glass did not fall within the scope of the '886 patent claims. The district judge subsequently entered judgment on the verdict. On appeal, PPG argues that the district judge erred in construing the claims of PPG's patent and, alternatively, that substantial evidence did not support the jury's verdict of non-infringement. We affirm.

I

PPG and Guardian both manufacture green-tinted solar control glass. The glass filters out much of the ultraviolet and infrared radiation from the sun while maximizing the transmission of light in the visible spectrum. Infrared radiation transmits heat energy, and ultraviolet radiation can be damaging to materials. The capacity of solar control glass to block the transmission of sunlight at those wavelengths, while remaining largely transparent to visible light, makes the product particularly well-suited for use in automobile windows.

Guardian began selling SMG glass in 1992. PPG's '886 patent issued on August 31, 1993. After licensing negotiations failed, PPG sued Guardian for infringing the patent.

The '886 patent is directed to a green-tinted glass with specific light transmittance characteristics. The patent contains one independent claim, which reads as follows:

1. A green tinted, ultraviolet absorbing glass having a base glass composition consisting essentially of:

SiO ₂	68-75 weight %
Na ₂ O	10-20
CaO	5-15
MgO	0-5
Al ₂ O ₃	0-5
K ₂ O	0-5

and a colorant portion consisting essentially of:

CeO ₂	Less than 0.5 weight %
*Total iron (as Fe ₂ O ₃)	Greater than 0.85 weight %
FeO/total iron	Less than 0.275

exhibiting ultraviolet transmittance no greater than 31 percent (300 to 390 nanometers) and luminous transmittance (illuminant A) of at least 70 percent, both at a reference thickness of 3.9 millimeters.

Cite as 156 F.3d 1351 (Fed. Cir. 1998)

Claim 4, the only claim asserted against Guardian at trial, adds an additional limitation that the glass must exhibit a total solar energy transmittance of less than 45 percent at a reference thickness of 3.9 millimeters. cause the trapped gas bubbles to dissipate, leaving few visible imperfections in the glass. Some of the sulfate introduced into the batch remains dissolved in the glass composition, but it is colorless and has no effect on the transmittance properties of the glass.

The '886 patent identifies iron and cerium oxide as colorants. Iron may be present in either the ferrous (Fe^{2+}) or ferric (Fe^{3+}) states. Ferrous iron gives the glass a greenish tint and is an infrared radiation absorber. Ferric iron gives the glass a yellowish tint and acts to absorb ultraviolet radiation.

One of the advantages of the invention described by the '886 patent is that the glass requires only minimal amounts of cerium oxide to achieve the desired light transmittance properties. Cerium oxide is expensive and presents special difficulties in the manufacturing process. PPG's patent teaches that using relatively high concentrations of iron oxides as colorants and maintaining the glass composition at a low redox ratio (the ratio of ferrous iron to total iron) reduces or eliminates the need for cerium oxide in the glass. Guardian's SMG glass uses similarly high levels of iron oxide as a colorant and uses no cerium oxide.

PPG and Guardian use similar technologies to produce tinted glass. The glass is produced by the "float" process, which refers to the method of cooling the glass after it exits the furnace by floating it on a pool of molten tin. The tin provides an extremely flat surface for cooling the glass, so that sheets of glass can be produced at precise, uniform thicknesses.

Two features of the float process are particularly pertinent to the current dispute. The raw materials for the glass are typically added together in a furnace, where they are mixed and melted. As the various glass constituents melt, they release gas. That is potentially a problem because some of the gas may remain trapped in small bubbles in the glass. If the bubbles remain in the final product, they result in visible imperfections in the glass. To avoid that problem, various melting and fining aids are added to the glass mixture in the furnace. Sodium sulfate (Na_2SO_4) is one such additive. In the mixture, much of the sulfate decomposes into sulfur dioxide and oxygen. Those gases

cause the trapped gas bubbles to dissipate, leaving few visible imperfections in the glass. Some of the sulfate introduced into the batch remains dissolved in the glass composition, but it is colorless and has no effect on the transmittance properties of the glass.

The second pertinent feature of the process is the interaction between the glass and the pool of molten tin on which it floats after exiting the furnace. Both Guardian's SMG manufacturing process and PPG's patent specification require that the glass be produced at a low redox ratio, which means that the glass is produced under oxidizing conditions. Although the redox ratio is commonly reported for the glass as a whole, oxidation conditions are considerably different at the boundary of the glass and the molten tin. That interface zone experiences strong reducing conditions, resulting in a high redox ratio. Under those conditions, oxygen atoms are stripped away from the sulfate remaining in the glass, reducing it to sulfide ions (S^{2-}). When the sulfide ions combine with ferric iron, the resulting compound (FeS_x) imparts a yellowish-brown coloration to the glass. Testimony at trial indicated that iron sulfide formation could be observed to a depth of about 20 microns from the glass surface contacting the molten tin. That narrow band is commonly referred to as the "tin layer" of the glass.

At the inception of this suit, the chemistry of the tin layer was not an issue. PPG sought a preliminary injunction and Guardian defended on the ground that SMG glass contained iron sulfide, an ingredient unlisted in PPG's patent, as a colorant. The district judge credited testimony from PPG's experts that iron sulfide could not form in Guardian's glass because of the low redox ratio at which the glass was produced. As a result, the district judge rejected Guardian's "sulfide defense" and granted a preliminary injunction. On appeal, this court affirmed. See *PPG Indus., Inc. v. Guardian Indus. Corp.*, 75 F.3d 1558, 1565, 37 U.S.P.Q.2d 1618, 1624 (Fed.Cir.1996).

By the time of trial, Guardian had refined its non-infringement position. While Guardian still claimed that the presence of iron sulfide differentiated SMG glass from PPG's

patent, Guardian now identified the primary source of the iron sulfide as the tin layer of the SMG glass. Witnesses for each side agreed that the iron sulfide in the tin layer of the SMG glass resulted in a 0.5% change in total light transmittance and a small change in color, measured by a 3 nanometer shift in the dominant wavelength of the light transmitted by the glass. PPG argued that the small changes in the properties of the glass attributable to the iron sulfide in the tin layer did not avoid infringement of the claims of the '886 patent. PPG also contended that the iron sulfide in the tin layer was an inherent by-product of the float glass manufacturing process used by both Guardian and PPG. The jury, however, returned a verdict in Guardian's favor, finding that the SMG glass did not infringe the '886 patent. In view of its infringement verdict, the jury did not reach the merits of Guardian's invalidity defense. PPG appealed the denial of its motions for judgment as a matter of law and for a new trial.

II

[1] PPG contends that the district judge improperly construed the term "consisting essentially of" in the '886 patent and that the jury verdict must be vacated because it was based on an incorrect claim construction. "Consisting essentially of" is a transition phrase commonly used to signal a partially open claim in a patent. Typically, "consisting essentially of" precedes a list of ingredients in a composition claim or a series of steps in a process claim. By using the term "consisting essentially of," the drafter signals that the invention necessarily includes the listed ingredients and is open to unlisted ingredients that do not materially affect the basic and novel properties of the invention. A "consisting essentially of" claim occupies a middle ground between closed claims that are written in a "consisting of" format and fully open claims that are drafted in a "comprising" format. See *Ex parte Davis*, 80 U.S.P.Q. 448, 449-50, 1949 WL 3555 (Pat. Off. Bd. App. 1949); *Manual of Patent Examining Procedure* § 2111.03 (6th ed. 1997).

The district judge's instructions to the jury closely tracked the established definition of

the phrase "consisting essentially of." The jury was instructed that "consisting essentially of" means that "the claimed glass invention has in it the ingredients that are specifically identified in the claim.... Other ingredients may also be present in the glass, although not specifically identified in the claim; so long as those other unlisted ingredients do not have a material effect on the basic and novel characteristics of the glass." PPG and Guardian agreed that the basic and novel characteristics of the glass are color, composition, and light transmittance. The court added that an ingredient has a material effect on the characteristics of the glass "if the effect is of importance or of consequence to those of ordinary skill in the art of glass making." The jury was further instructed that it was to determine as a factual matter "whether the presence of sulfur found in the sulfide form has a material effect on the basic and novel properties of the glass."

PPG raises two issues with respect to the district judge's instructions. First, PPG argues that the determination whether iron sulfide has a "material effect" on the invention is a matter of claim construction and that the judge erred in placing that issue before the jury as part of the infringement determination. Second, PPG argues that the judge failed to construe the term "material effect" in a manner consistent with the patent specification, leaving the jury free to apply a different test as to what constitutes a material effect on the total light transmittance and color of the glass.

[2] A

[2] PPG's broadest argument is that the district judge was required to determine as a part of claim construction whether iron sulfide could have a material effect on the basic and novel characteristics of the claimed glass. PPG begins with the premise that a patentee is entitled to have the meaning and scope of its patent determined as a matter of law. See *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 979, 34 U.S.P.Q.2d 1321, 1329 (Fed. Cir. 1995) (in banc), *aff'd*, 517 U.S. 370, 116 S.Ct. 1384, 134 L.Ed.2d 577, 38 U.S.P.Q.2d 1461 (1996). That principle is undermined, argues PPG, by allowing juries

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to determine whether a particular unlisted element has a material effect on the invention. Because two different juries could come to different conclusions with respect to the materiality of the same unlisted ingredient, PPG contends, the claim has not been construed with sufficient specificity.

[3, 4] Claims are often drafted using terminology that is not as precise or specific as it might be. As long as the result complies with the statutory requirement to "particularly point[] out and distinctly claim[] the subject matter which the applicant regards as his invention," 35 U.S.C. § 112, para. 2, that practice is permissible. That does not mean, however, that a court, under the rubric of claim construction, may give a claim whatever additional precision or specificity is necessary to facilitate a comparison between the claim and the accused product. Rather, after the court has defined the claim with whatever specificity and precision is warranted by the language of the claim and the evidence bearing on the proper construction, the task of determining whether the construed claim reads on the accused product is for the finder of fact. See, e.g., *W.L. Gore & Assocs., Inc. v. Garlock, Inc.*, 842 F.2d 1275, 1280, 6 U.S.P.Q.2d 1277, 1282 (Fed.Cir.1988) (whether claim limitation of "about 100% per second" is literally met is a question of fact).

The proper allocation of the tasks of construing a claim and determining infringement in a case in which a claim contains an imprecise limitation is demonstrated by our decision in *Modine Manufacturing Co. v. United States International Trade Commission*, 75 F.3d 1545, 37 USPQ2d 1609 (Fed.Cir.1996). In *Modine*, the patentee had claimed a condenser for an automotive air conditioning system with "relatively small" hydraulic diameters. *Id.* at 1549. From the specification and prosecution history of the patent, this court concluded that the term "relatively small" should be interpreted as referring to a range of diameters of "about 0.015-0.040" inches. *Id.* at 1554. Instead of attempting to define that range more precisely, we remanded the case for a factual determination of whether the claim limitation was literally infringed by accused products having diam-

ters ranging from 0.0424 to 0.0682 inch. *Id.* at 1554-55.

Like the patents at issue in *Modine* and *Gore*, the '886 patent contains some inherent imprecision resulting from the use of the term "consisting essentially of." As PPG points out, it is possible that under such circumstances different finders of fact could reach different conclusions regarding whether the effect of a particular unlisted ingredient in an accused product is material, and thus whether that product infringes. That possibility, however, is a necessary consequence of treating infringement as a question of fact subject to deferential review. It does not mean that the claim was improperly construed as an initial matter.

B

[5] PPG further argues that even if the jury was correctly delegated the task of deciding whether iron sulfide in SMG glass materially affects the properties of the glass, the definition of "consisting essentially of" given to the jury should have reflected information in the patent specification concerning what effects the inventors considered to be material. Under well-settled principles, PPG was entitled to provide its own definition for the terms used in its patent claim, including the transition phrase "consisting essentially of." In *Water Technologies Corp. v. Calco, Ltd.*, 850 F.2d 660, 666, 7 U.S.P.Q.2d 1097, 1102 (Fed.Cir.1988), for example, this court looked to the prosecution history of a patent to determine whether an unlisted ingredient was excluded from the scope of a "consisting essentially of" claim. Thus, PPG could have defined the scope of the phrase "consisting essentially of" for purposes of its patent by making clear in its specification what it regarded as constituting a material change in the basic and novel characteristics of the invention. The question for our decision is whether PPG did so.

PPG argues that it provided such a definition of materiality, basing its argument on a sentence in the specification that describes the method of producing the claimed glass composition. That sentence states that "[m]elting and fining aids such as SO₃ are useful during production of the glass, but

their residual amounts in the glass may vary and have no significant effect on the properties of the glass product." PPG asserts that one of skill in the art would understand the term "SO₃" to encompass all sulfur compounds, including iron sulfide. Because the specification teaches that residual amounts of melting and fining aids such as SO₃ have no significant effect on the properties of the glass, PPG argues that the effect of any iron sulfide in the glass recited in the claims must be deemed not to be material. Essentially, PPG is arguing that the reference to SO₃ in the specification means that regardless of what effect sulfur compounds such as iron sulfide have on the properties of the glass, the effect cannot be considered "significant" for purposes of the '886 patent.

PPG's argument necessarily depends on its assertion that "SO₃" should be ascribed a meaning in the patent different from its ordinary meaning as the chemical formula representing a molecule containing one sulfur atom and three oxygen atoms. Although the specification is silent on that point, PPG was entitled to produce extrinsic evidence to show how one of skill in the art would interpret "SO₃" in the context in which it was used. *See Pall Corp. v. Micron Separations, Inc.*, 66 F.3d 1211, 1216, 36 U.S.P.Q.2d 1225, 1228 (Fed.Cir.1995).

The principal evidence on this point adduced by PPG was testimony that it is a common practice in the glassmaking art to report the weight percent of sulfur in glass as "SO₃" regardless of the form in which the sulfur is actually present. That practice was apparently adopted as a convention because the most convenient ways of measuring the amount of sulfur in glass do not distinguish among the various sulfur compounds.

While not disputing that "SO₃" is frequently used to denote the amount of sulfur in glass, Guardian introduced evidence to show that one of skill in the art would not believe that "SO₃" in the critical specification sentence was intended to cover all forms of sulfur. Instead, Guardian argued that "SO₃," as used in the specification, refers only to the dissolved sulfate retained in the glass composition.

Guardian notes that the sentence on which PPG relies is directed to the use of "melting and fining aids" in glass. While sulfate is a well-known fining aid in glass, Guardian points out that other sulfur compounds are not suitable for use in that capacity. For that reason, Guardian argues, one of skill in the art would not expect a reference to "SO₃" in the context of melting and fining aids to encompass wholly different sulfur compounds, such as iron sulfide, with entirely different properties.

Guardian also argues that the reference to "SO₃" must be limited to dissolved sulfates because an interpretation that includes all sulfur compounds would call into question the accuracy of the statement in the specification that the "residual amounts [of SO₃] in the glass can vary and have no significant effect on the properties of the glass product." Witnesses for both parties agreed that residual sulfate in the glass could vary substantially as a result of the production parameters without having a measurable effect on the resulting glass product. Because iron sulfide is a strong colorant, however, the properties of the glass would vary significantly with the amount of sulfur in the glass in the form of iron sulfide. Accordingly, we interpret the sentence in the specification to refer only to sulfate; interpreted in that manner, the sentence accurately describes the effect of sulfate in the glass as insignificant.

We are fortified in our interpretation of the specification by the fact that PPG has not offered a satisfactory alternative construction. PPG's position at trial was that a "significant" change in the glass properties is one that results in a glass product that does not satisfy the color or transmittance limitations of the patent claims. That proposed definition is suspect, however, because it would mean that any residual sulfur compound in the glass composition could avoid the "consisting essentially of" limitation only by taking the glass outside the other limitations of the patent. If that definition of "significant effect" were adopted, it would have the effect of converting the critical claim language from "consisting essentially of" to "comprising." PPG's witnesses cast further doubt on the

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correctness of PPG's proposed construction by agreeing that "in the context of science," large changes in glass properties that still fell within the color and transmittance limitations of the claim would be considered significant. We therefore reject PPG's argument that the specification requires that the claims of the '886 patent be construed to encompass glass products that contain iron sulfide in any amount, as long as the accused products satisfy the other limitations of the claims.

PPG makes the further contention that the claim construction adopted by the district court must be incorrect because it would exclude PPG's preferred embodiment from the patent, a result that is "rarely, if ever, correct." *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1583, 39 U.S.P.Q.2d 1573, 1578 (Fed.Cir.1996). PPG's argument is that the preferred embodiment described in the '886 patent is made by the float process, uses sulfate as a melting and fining aid, and can therefore be expected to have a tin layer containing iron sulfide, just as SMG glass does.

The problem with PPG's argument is that the claim construction adopted by the district judge did not exclude from coverage all glass products that contain some amount of iron sulfide. The district judge properly recognized that the patent is silent about iron sulfide and about what constitutes a material effect on the properties of the glass. The court properly left it to the jury to determine whether the amounts of iron sulfide in SMG glass have a material effect on the basic and novel characteristics of the glass. PPG did not prove that its preferred embodiment would necessarily be excluded by the claim construction given to the jury.

III

[6] PPG's final argument is that even if the district court's claim construction was correct, the verdict of non-infringement must be overturned because a reasonable jury could not have found that the iron sulfide residues resulting from the float glass process materially affect the basic and novel characteristics of the invention. Although it was undisputed that the iron sulfide in the SMG glass causes small changes in the trans-

mittance and dominant wavelength of the glass, PPG contends that the jury could not properly find that those changes were material for purposes of determining whether the colorant portion of the SMG glass "consist[ed] essentially of" the ingredients listed in claim 4 of the '886 patent.

Although the evidence was in conflict on this point, there was substantial evidence from which the jury could conclude that the iron sulfide in SMG glass had a material effect on the basic and novel properties of the glass. Guardian introduced evidence that those of skill in the art would regard even small changes in the color or transmittance of tinted glass to be material. At one point, that view was apparently shared by PPG's witnesses. Guardian introduced deposition testimony from a PPG expert witness to the effect that he considered any "measurable" change in color or transmittance to be material or significant. Moreover, Guardian's technical expert elaborated that one of skill in the art would consider measurable, reproducible changes that are "distinctly bigger" than could be expected from experimental error to be material. Guardian's plant manager also testified as to why small but measurable changes in glass properties are important to those of skill in the art. Accordingly, although the evidence showed that the effects of the iron sulfide in SMG glass were small, there was sufficient evidence from which the jury could find that the effects were material.

In response to the argument that SMG glass is identical to the preferred embodiment in PPG's patent, Guardian distinguished SMG glass by introducing evidence that it uses 500% more sulfate as a batch material in producing SMG glass. Although most of the sulfate dissipates as a gas, Guardian's evidence showed that SMG glass retains approximately 40% more sulfate than the preferred embodiment. The jury was entitled to credit that evidence over contrary evidence adduced by PPG, which tended to show that the effect of iron sulfide in SMG glass and the preferred embodiment of the patent were identical in most respects. We therefore must uphold the jury's conclusion that SMG glass does not infringe claim 4 of

the '886 patent because the colorant portion of the SMG glass does not "consist essentially of" the listed ingredients.

AFFIRMED.

MICHEL, Circuit Judge, dissenting.

I cannot join the majority opinion which upholds a jury verdict of non-infringement which no reasonable jury could have reached. Our precedent is well settled that when a chemical invention is claimed using "consisting essentially of" language, the mere presence of an additional, unclaimed substance—here, iron sulfide—does not avoid infringement unless it has a "material" effect on the basic and novel properties of the claimed invention. No reasonable jury could hold that an alteration in the dominant wavelength of the glass from approximately 500 to approximately 503 nanometers, and alterations in the ultraviolet and visible light transmittance on the order of 0.5% represent a material effect on the properties of the glass considered in light of the patent. The specification recites a range of 495 to 535 nanometers and the specific language of the claim describes a glass with ultra-violet transmittance of no greater than 31% and visible light transmittance of at least 70%. The written description specifies that sodium sulfate, the precursor of the non-claimed iron sulfide, is to be used as a fining agent in heating the ingredients of the glass and does not have a material effect on transmittance properties.

I believe that if the court had provided a proper definition of materiality in its jury instructions, a finding of infringement would have resulted. Similarly, if on post-trial motion for judgment as a matter of law of literal infringement the court had applied the correct definition of materiality in the context of the claims and written description of this patent, it would have granted the motion. Because the court did neither, I would reverse and direct the district court to enter a liability judgment of literal infringement and proceed to decide damages.

Abraham FRIEDMAN, Plaintiff-Appellant,
v.

William DALEY, Secretary of the Department of Commerce, Department of Commerce, International Trade Commission, Department of State and United States Trade Representative, Defendants-Appellees.

No. 98-1148.

United States Court of Appeals,
Federal Circuit.

Oct. 5, 1998.

Minority shareholder and general manager of Mexican company sued Secretary of the Department of Commerce, Department of Commerce, International Trade Commission, Department of State, and United States Trade Representative, to compel them to assist him with Mexican tariff permit problem and litigation with landlord. The United States Court of International Trade, Evan J. Wallach, J., 977 F.Supp. 1242, dismissed for lack of jurisdiction, and plaintiff appealed. The Court of appeals for the Federal Circuit held that plaintiff's claims were not within zone of interests protected by statute creating the United States and Foreign Commercial Service.

Affirmed.

1. Administrative Law and Procedure ☞666

To prevail on claim to compel unlawfully withheld agency action under the Administrative Procedure Act (APA), plaintiff had to prove that the injury he complained of fell within the zone of interests sought to be protected by the statutory provision whose violation formed the legal basis for his complaint, and in applying this "zone of interest test," the essential inquiry is whether Congress intended for a particular class of plain-

